Chapter 7
Could Bunker Fuel Price Changes Impact Coal Spot Rates and Shipping’s Carbon Emissions?

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ABSTRACT
This chapter aims to assess the impact of bunker fuel price changes on spot freight rates for shipping coal, by estimating relevant elasticities using a top down approach. Monthly time series data drawn from Clarkson’s Shipping Information Network revealed a breakpoint in late 2004 defining two distinct phases. Ordinary least squares modelling revealed low elasticities in a relatively stable market from 1991-2004 and high elasticities in a volatile market from 2005-2012. Knowledge of relevant elasticities inputs to effective global management of for example shipping’s atmospheric emissions. Coking coal freight rates are more responsive to bunker prices than steam coal markets. In a volatile market, market based measures to reduce shipping’s emissions which might include a bunker fuel levy, appear to have greater impacts on freight rates. However, complexities in the market environment frustrate effective policy formulation.

INTRODUCTION
Bulkers are ships which transport undifferentiated loads of a commodity in bulk. These can include wet cargoes, mainly crude oil related, or dry cargoes principally including ores, coal, grain or timber. Dry bulkers are the ship type which contributes the second largest total volume of CO₂ emissions (Buhaug et al., 2009; Smith et al., 2014a) and their cargoes include coal which is transported globally. In 2010 coal was the second largest dry bulk trade comprising 38.6% of dry bulk shipping movements (UNCTAD, 2012). Further, fuel costs typically explain 24% of raw material maritime transport costs (Korinek & Sourdin, 2009) and with a relatively low value to weight ratio, coal freight is sensitive to transporta-
tion cost changes which contribute 25-33% of total delivered price (Notteboom & Vernimme, 2009). If inflated bunker prices significantly impact the spot freight rate for coal they are also likely to affect its delivered market price. As a device to combat climate change, market based measures to reduce shipping’s atmospheric emissions, particularly CO₂, could include a bunker fuel levy implying that knowledge of relevant elasticities is required to inform effective policies to attempt to mitigate climate change.

Controversy also surrounds whether recent developments have significantly changed freight markets post-2005. Although already volatile (Zeng and Qu, 2014; Leonov & Nikolov, 2012) if markets become even more so they would be more responsive to a bunker fuel levy. On most shipping routes and products, Vivid Economics (2010) considered one undivided time period from 1990 to 2010 and did not explicitly incorporate structural breakpoints in their elasticity estimates linking spot freight rates to bunker prices. However, other studies indicate that since China became a dominant importer of major dry bulks commodities including coal and iron ore, more volatile oil prices and freight rates have defined a changed trading system since January 2005 (Yang, Xuan, & Jackson, 2012). A breakpoint observed in dry bulk markets in January 2003 has been attributed to a shift from markets dominated by troughs in 1990-2002 compared with growth and later decline in 2003-2010 (Chen, Meersman, & van de Voorde, 2012). Kaufmann’s (2011) analysis of oil prices highlighted fundamental changes in oil market system behavior in 2007-2009 as interruptions in non-OPEC oil production forced an unexpected price hike fuelled by private restocking, thereby reversing two decades of reducing oil inventories. Oil prices plummeted as the traditional link between spot and futures prices was broken by speculative short-term trading. Independently, Salisu & Fasanya (2012) identified breaks in 1990 and 2008. Work on container freight rates has also found that oil prices affect bunker fuel costs and maritime freight rates, with higher elasticities during periods of rising and volatile oil prices rather than periods of low and stable oil prices (UNCTAD, 2010). Similar evidence in coal freight markets would reinforce findings of changed market operation.

This chapter aims to assess the impact of bunker fuel price changes on spot freight rates for shipping coal. To achieve this aim involves several objectives. Firstly, it is necessary to review the nature of coal market shipments. This includes consideration of the global demand for coal, associated seaborne trade and shipments, some determinants of coal freight rates and how an effective bunker price levy to manage shipping’s carbon emissions would depend on freight rate responses following bunker price increases. Secondly, to assess the effect of bunker fuel price changes on spot freight rates for shipping coal requires discussion of a methodology for undertaking empirical studies and the data and variables considered. Thirdly to present empirical results, the data series and results for ten routes over two time periods along with various group means and an extended set of dependent and independent variables are analyzed, along with some sample iron ore routes. Fourthly, to present possible solutions and make recommendations, some policy implications of the elasticities estimated using a top down approach, are discussed. Finally to guide future research, a range of additional considerations are broached, before concluding.

BACKGROUND

Coal Trade and Shipments

In 2010 global coal imports of 904 Mt flowed mainly into East Asia and Western Europe and coal will continue to support the global energy mix. From 1965 to 2005 coal movements increased at 6.3% compound annual rate (EIA, 2009), the most rapidly growing major dry bulk trade. Seaborne coal markets
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